

# Changing ICT Rankings of African Nations

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## Abstract

*After years of being an information and communication technology laggard relative to other developing regions of the world, Africa has been pushed to the forefront in a new information revolution, thanks to mobile communications. This period has also witnessed considerable mobility in the information and communication technology rankings of different African nations. This article examines changes in the information and communication technology rankings of different African nations and concludes that, as an analytical framework, the “digital divide” does not accurately describe what is happening on the continent and may lead to policy choices that are harmful to Africa’s future.*

The phenomenal development of mobile communications on the continent of Africa, in particular since the turn of the new millennium, is one of the most heartening examples of how information and communication technologies (ICTs) can transform economic and social life. After years of being an ICT laggard relative to other developing regions of the world, African has been pushed – by mobile communications – to the forefront in a new information revolution. Consider these soundbytes:

- Africa has added more ICT users in the first few years of the new century than in the previous hundred.
- Africa was the first region in the world where the number of mobile users overtook the number of fixed lines (in 2001); and by the start of 2004 there were more than twice as many mobile users as fixed lines (see Figure 3.1, below, left chart).
- Africa has had the fastest growing mobile sector of any world region over the last five years and has the highest percentage of mobile users as a percentage of total telephone subscribers (Figure 3.1, below, right chart).
- More than three-quarters of African states now have competition in the mobile market and more than 95% of African users enjoy a choice of operator.

Such growth was not predicted. Most forecasts of demand for telecommunications in Africa made in the 1990s were based on the assumptions that mobile services were generally priced at a higher level than fixed-line services, and that considerable investments would be needed to establish new networks, and this would therefore retard their growth. Experience has since shown that, although these assumptions may be valid, the strong demand to communicate – using whatever means are available – was sufficient to drive the market.

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\* The views expressed in this article are those of the author and do not necessarily reflect the opinions of ITU or its membership. For more information on this topic, and for background data, please see *African Telecommunication Indicators* (ITU, 7<sup>th</sup> edition, May 2004), [www.itu.int/ti](http://www.itu.int/ti).

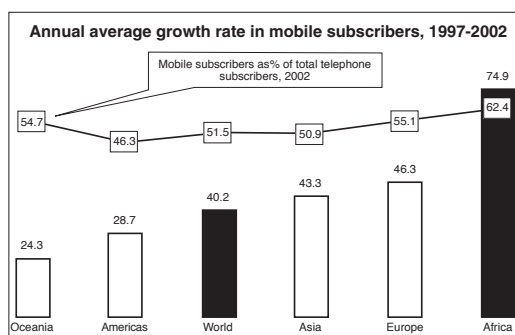
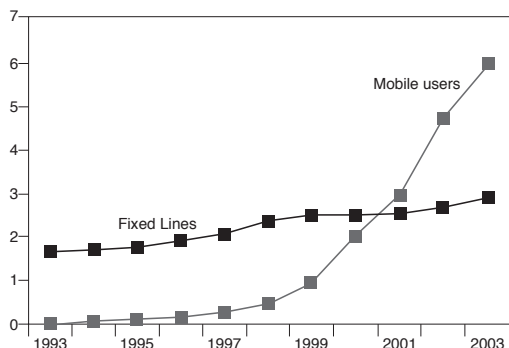
This period has also witnessed considerable mobility in the ICT rankings of different African nations. Many nations that did well in the 1990s are not doing so well now, while other nations have made surprising gains. Again this runs counter to received wisdom.

### Figure 3.1: Africa's mobile revolution

Mobile telephone users overtaking fixed lines in Africa, 1993-2003

Mobile growth rates by region, worldwide, 1997-2002

Fixed line and mobile penetration, per 100 inhabitants



Source: ITU World Telecommunication Indicators Database.

Much of the current debate concerning the so-called “digital divide” seems to assume that the *status quo* in access to ICTs will continue to exist long into the foreseeable future. This article examines changes in the ICT rankings of different African nations and concludes that, as an analytical framework, the “digital divide” does not accurately describe what is happening on the continent; in fact, it is argued, the “digital divide” may lead to policy choices that are harmful to Africa’s future.

### Which indicator to use?

What is the best way of measuring progress in ICTs? Typically, the measure of choice has been “teledensity” – or fixed telephone lines per 100 inhabitants. However, in the case of Africa, this is not particularly meaningful now that mobile telephone users outnumber fixed lines in 44 out of 55 African economies at the end of 2003 (see Table 3.1). An alternative would be to measure “mobidity” – mobile telephones per 100 inhabitants, but this would disadvantage those economies, like Egypt or Libya, where the fixed-line network is well established, or others, like Eritrea or Ethiopia, where the mobile network is still in its infancy.

**Table 3.1: Effective teledensity (mobile or fixed – whichever is higher) per 100 inhabitants, Africa, 1993-2003**

Country	Effective Teledensity		
	1993	2003	CAGR
Algeria	3.66	6.93	6.6%
Angola	0.49	<b>1.32</b>	10.3%
Benin	0.32	<b>3.36</b>	26.5%
Botswana	2.68	<b>29.71</b>	27.2%
Burkina Faso	0.21	<b>1.85</b>	24.2%
Burundi	0.23	<b>0.90</b>	14.8%
Cameroon	0.45	<b>6.62</b>	30.9%
Cape Verde	3.23	15.63	17.1%
Central African Rep.	0.20	<b>0.97</b>	17.2%
Chad	0.07	<b>0.80</b>	27.4%
Comoros	0.76	1.66	8.1%
Congo	0.76	<b>9.43</b>	28.7%
Congo (DR)	0.09	<b>1.89</b>	35.6%
Cote d'Ivoire	0.66	<b>7.43</b>	27.4%
Djibouti	1.32	<b>3.44</b>	10.1%
Egypt	3.66	12.73	13.3%
Equatorial Guinea	0.35	<b>7.64</b>	36.1%
Eritrea	0.39	0.92	8.8%
Ethiopia	0.25	0.63	9.5%
Gabon	2.79	<b>22.44</b>	23.2%
Gambia	1.40	<b>12.71</b>	24.6%
Ghana	0.30	<b>3.56</b>	28.1%
Guinea	0.17	<b>1.44</b>	23.8%
Guinea-Bissau	0.64	0.82	2.6%
Kenya	0.89	<b>5.02</b>	18.9%
Lesotho	0.61	<b>7.26</b>	28.0%
Liberia	0.16	<i>0.21</i>	2.4%
Libya	4.84	13.56	10.9%
Madagascar	0.31	<b>1.71</b>	18.7%
Malawi	0.35	<b>1.29</b>	13.9%
Mali	0.15	<b>2.30</b>	31.4%
Mauritania	0.33	<b>10.90</b>	42.0%
Mauritius	7.35	<b>37.87</b>	17.8%
Mayotte	3.80	<b>21.56</b>	19.0%
Morocco	2.56	<b>24.34</b>	25.3%
Mozambique	0.39	<b>2.28</b>	19.3%
Namibia	4.21	<b>11.63</b>	10.7%
Niger	0.12	<b>0.20</b>	4.6%
Nigeria	0.32	<b>2.55</b>	23.1%
Reunion	29.99	<b>74.74</b>	9.6%
Rwanda	0.20	<b>1.60</b>	22.9%
São Tomé e Príncipe	1.98	4.95	8.8%
Senegal	0.75	<b>5.56</b>	22.1%
Seychelles	14.23	<b>68.18</b>	17.0%
Sierra Leone	0.33	<b>2.75</b>	23.7%
Somalia	0.17	<b>0.54</b>	12.4%
South Africa	9.35	<b>36.36</b>	14.5%
Sudan	0.25	2.70	27.0%
Swaziland	1.78	<b>8.43</b>	16.8%
Tanzania	0.31	<b>2.52</b>	23.2%
Togo	0.41	<b>4.40</b>	26.9%
Tunisia	4.42	<b>19.21</b>	15.8%
Uganda	0.17	<b>3.03</b>	33.1%
Zambia	0.92	<b>2.15</b>	8.8%
Zimbabwe	1.22	<b>3.22</b>	10.2%
Average	1.61	6.77	15.5%

*Note: Figures highlighted in bold are those economies where mobile telephone users outnumber fixed lines. CAGR = Compound Annual Growth Rate. Italics = estimated data. Source: ITU World Telecommunication Indicators Database.*

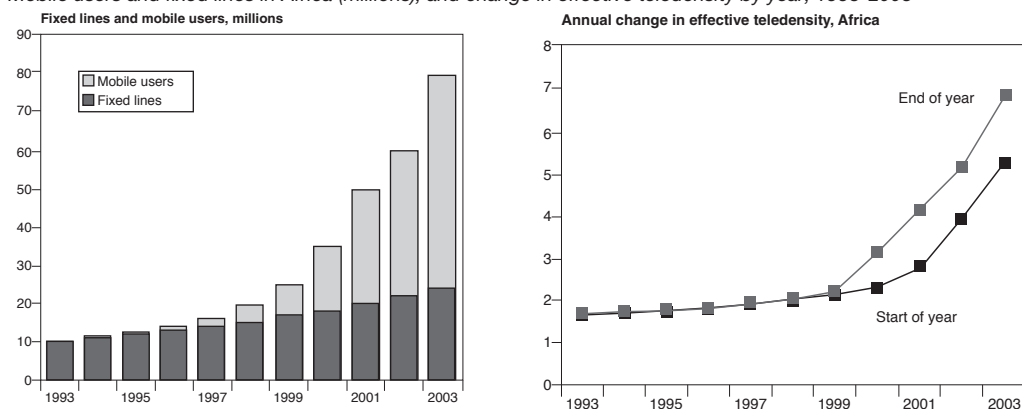
A third possible choice would be to count “total teledensity” – or mobile and fixed lines combined. This would provide an impressive level, for both penetration rate and total number of subscribers (see Figure 3.2). But, from an analytical point of view, this indicator has limitations because of the degree of double counting of individuals or households that possess both a fixed-line telephone and a mobile telephone.

Probably the best choice for measuring a country’s (and a continent’s) progress in ICTs is “effective teledensity”. This is measured as “fixed lines or mobile users – whichever is higher – per 100 inhabitants”. This indicator does not suffer from the problems of double-counting and allows for comparison between countries that are doing well in both mobile and fixed-line networks as well as those that are doing well in one but not the other.

As a side issue here, there is scope for much more research on the topic of cross-ownership of mobile and fixed-line telephones. It would be interesting to know, for instance, the percentage of families that have either one or the other, the percentage that have both and the percentage that have neither. It would also be interesting to know whether the trend is towards greater cross-ownership or whether the purchase of a mobile telephone is considered to obviate the need for a fixed-line telephone. But gathering these types of data requires household census surveys and they are, therefore, expensive to collect on a rolling basis.

**Figure 3.2: A season of growth**

*Mobile users and fixed lines in Africa (millions), and change in effective teledensity by year, 1993-2003*



Source: ITU World Telecommunication Indicators Database.

At least six African economies have experienced falls in their levels of fixed lines, of which the most dramatic has been South Africa, where the installed base of fixed lines has been falling since 1999. The introduction of competition in the fixed-line market may reverse this decline, but the policy failings of extending Telkom SA’s<sup>1</sup> period of exclusivity are all too clear.

<sup>1</sup>Telkom South Africa

## Revolutionary growth

As shown in Table 3.1, the average level of growth in effective teledensity in Africa over the last decade has been 15.5% per year. But this average hides a very different performance in the second half of the period from the first half. Since 1998, the growth rate in effective teledensity has been 24.6% per year, which is more than *four times higher* than for any comparable period in the past (see Figure 3.4, below, left chart). This step change is confirmed by the impact on annual change in effective teledensity (see Figure 3.2, above, right chart). In the 1990s, effective teledensity was typically rising by a few tenths of a percentage point at most; but since the late 1990s, effective teledensity has been rising by more than one percentage point per year.

Elsewhere in the world, notably in developed regions, the impact of mobile communications has generally been incremental and complementary to the existing fixed-line networks. But in Africa, the impact of mobile communications has been little short of revolutionary. The period since the late 1990s has been qualitatively different, in ICT terms, than anything that had gone before, especially for individual African economies, like Democratic Republic of Congo,<sup>2</sup> Mauritania or Uganda.

Within the continent of Africa, DR Congo and Guinea were the first economies where the number of mobile telephone users overtook the number of fixed lines, as long ago as 1998, followed by Côte d'Ivoire in 1999. By 2000, some 21 African economies had made it to the cross-over point, including South Africa and Morocco. In 2001, the African continent as a whole became the first world region to make the cross-over. By the start of 2004, mobile telephone users exceeded fixed lines by more than 99 times in the extreme case of DR Congo, but the gap is at least eight-fold in five African economies (Cameroon, Congo, DR Congo, Mauritania and Uganda). Africa, as a whole, had 52 million mobile telephone users at the end of 2003 compared with just 25 million fixed lines.

The gap between the fixed and mobile penetration is set to grow even wider in the coming years. In 2003, growth in the mobile market amounted to 38%, or almost 15 million new users, compared to just 8%, or two million new subscribers, in the fixed-line market. The ratios between mobile and fixed lines that currently prevail in countries like Morocco or South Africa will soon be the norm for the rest of the continent.

For many young Africans, their first experience of ICTs will be in using a mobile telephone. But is there a danger that this will be their *only* experience? The popularity of mobiles in Africa may be to the detriment of growth in the fixed-line Internet. Africa's share of global Internet users (1.8%) is far below its share of global mobile telephone users (3.8%) and mobile telephones outnumber personal computers by five to one. At some stage in the future, the mobile telephone network (or more accurately, wireless technologies in general)<sup>3</sup> will provide a viable solution for low-cost, high-speed access to the Internet, but this is not likely to happen within the next five years. Thus take-up of Internet in Africa may be constrained by the lack of growth in the fixed-line network.

## Digital divide or digital opportunities?

Is the digital divide a useful analytical construct for understanding the changes taking place in African society? The theory underpinning the digital divide is that differences in access to ICTs are determined by long-term structural factors, such as wealth or level of education, that tend to be

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<sup>2</sup> DR Congo.

<sup>3</sup> See an extended discussion on this topic in ITU (2004), *The portable Internet*, 6<sup>th</sup> edition in the ITU Internet Reports series, September 2004, 220 pp.

relatively stable over long time periods, or may even increase. To summarise, the “poor stay poor while the rich stay rich”, under a digital divide model.

The digital divide theory is similar to that of a class-based society, in which there is little social mobility. If the digital divide theory were a useful analytical tool for Africa, then the ranking among countries within the continent, as measured by effective teledensity, should remain relatively stable over time. By analysing changes in the rankings of economies over time, it is possible to “test” the validity of the digital divide hypothesis.

One could make a reasonable case for stability in rankings during the period from 1993-98, but the digital divide is not at all useful in explaining changes in the period since 1998. The digital divide may hold true for the four economies that top the chart (Réunion, Seychelles, Mauritius and South Africa), which were ranked the same in both 1993 and 2003, but further down the ladder, the hypothesis breaks down. Rather than a class-based society, the actual picture is one of intense social mobility. Apart from the top four, hardly any other country stays in the same place in the rankings.

One method of measuring the stability over time, or lack of it, in a dataset is to use the “Spearman’s Rank” test of the correlation coefficient.<sup>4</sup> In this particular case, we are not measuring correlation (each economy stays the same throughout the period!) but rather the degree of stability. Spearman’s Rank works by measuring the squares of the differences in rank in the dataset. Between 1993 and 1998, the sum of the squares of the differences in ranks ( $\sum d^2$ ) amounted to 894, giving an  $R^2$  of 0.968 (where 1 is perfect correlation, or in this case stability). But between 1998 and 2003, the  $\sum d^2$  is almost four times higher at 3 444, producing a much lower  $R^2$  of 0.876.

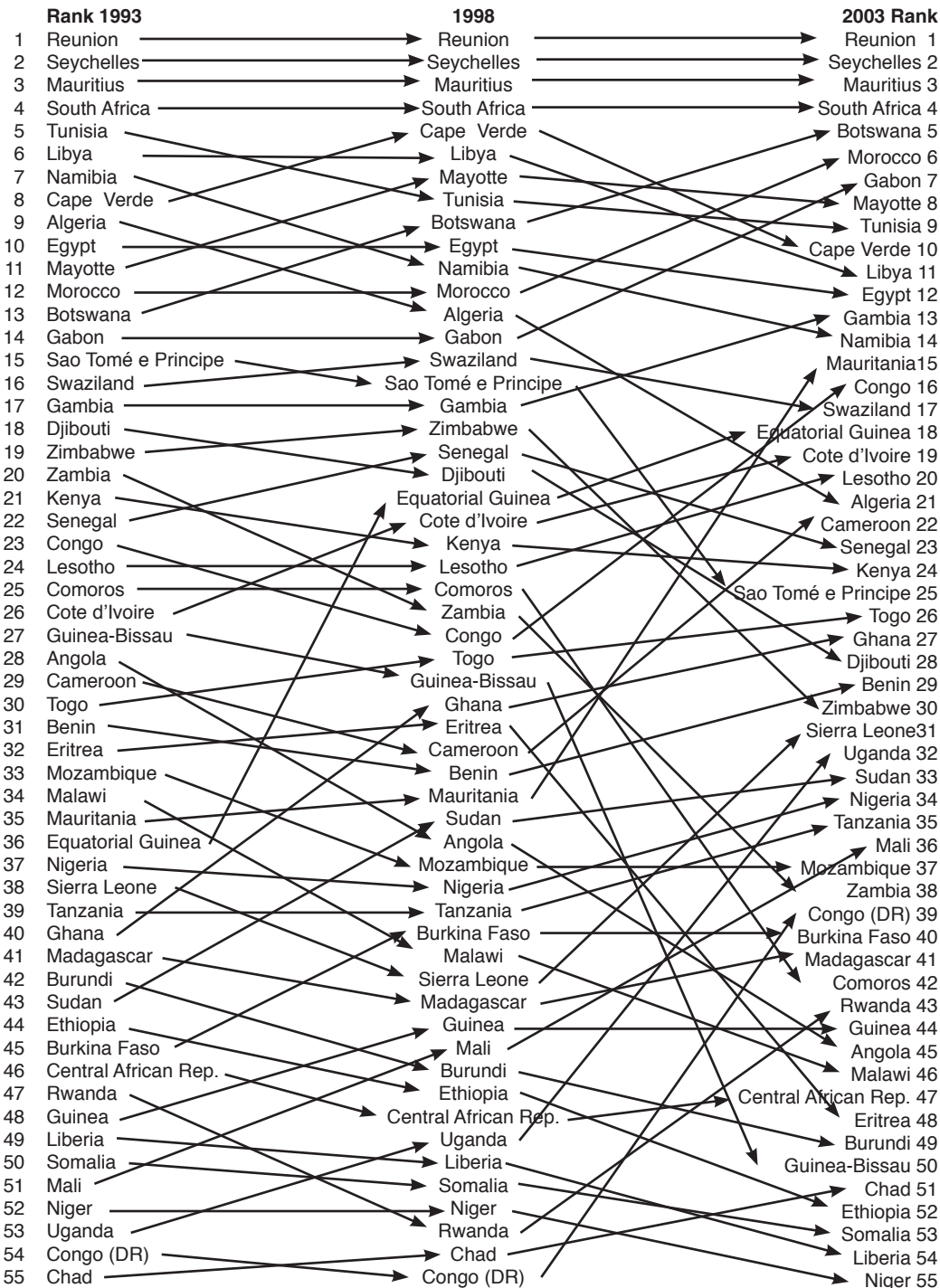
The implication of this is that there has been a step change in the performance of the African ICT market, starting from the late 1990s. Although the prime explanatory variable in this change is the rise of mobile communications, this phenomenon is actually coincident with a number of other policy changes, notably increasing market liberalisation (see Figure 3.4, below, right hand chart), the development of pre-paid billing as the dominant business model, the creation of independent telecommunication regulatory authorities and an increase in within-region investment. These changes have been mutually reinforcing.

The digital divide hypothesis is no longer an accurate predictor of what is happening in the African ICT market. A more accurate description might be “digital opportunities”, in that individual nations have shown much greater “mobility” in moving up or down the rankings, as measured by effective teledensity. The “starting position” of a particular economy is no longer an especially good predictor of where the “future position” will be. Consider the following examples:

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<sup>4</sup> For a description of Spearman’s Rank, see [www.geographyfieldwork.com/SpearmanRank.htm](http://www.geographyfieldwork.com/SpearmanRank.htm).

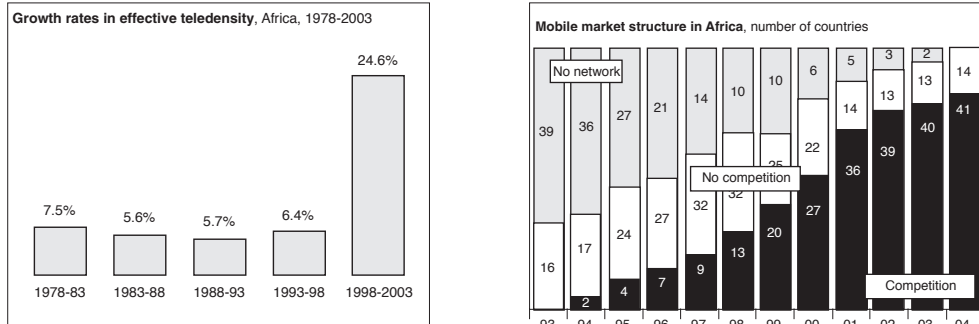
**Figure 3.3: Change in ranks, African economies, effective teledensity, 1993, 1998 and 2003**



Source: ITU analysis, based on data from ITU World Telecommunication Indicators Database.

**Figure 3.4: Step change**

Changes in growth rates of effective teledensity, 1978-2003, and mobile market, 1993-2004, in Africa



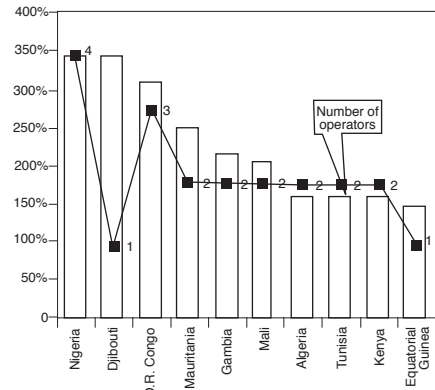
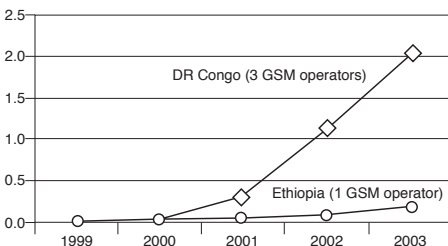
Source: ITU World Telecommunication Database (left chart), and ITU “African Telecommunication Indicators, 2004” (right chart).

- Mauritania, which began in 35<sup>th</sup> position in 1993 (see Table 3.1, above), had improved its position slightly by 1998, but then made substantial progress after the introduction of competitive mobile communications in 2000, rising to 15<sup>th</sup> position by 2003.
- The Democratic Republic of Congo began in 54<sup>th</sup> position and fell further to bottom place in 1998, but thereafter rose to 39<sup>th</sup> position by the end of the period. Political change in the economy, and the coming of peace, is part of the reason for this improved performance. But equally the fact that DR Congo had adopted a relatively liberal stance in comparison with some of its neighbours in opening up the mobile market to competition is also part of the reason for its success, particularly compared with near neighbours like Ethiopia that did not permit competition (see Figure 3.5, below, left chart). With one possible exception (Djibouti) it seems to be the case that those countries that have grown their mobile networks fastest since 2000 are the ones that permitted competition; and the more operators in the market, the faster the growth.
- All five North African economies saw their positions deteriorate, with the exception of Morocco, whose position improved from 12<sup>th</sup> to 6<sup>th</sup>. What explains Moroccan success? A key factor has been liberalisation of the Moroccan market through a licensing procedure (auction) that produced high revenues for the government, but an urgent imperative for the operators to generate revenue by rolling out their networks as quickly as possible.

**Figure 3.5: How many operators?**

Mobile user density in the DR Congo and Ethiopia, 1999-2003 (left chart), and Africa's fastest growing networks, 2000-03 (right chart)

Mobile subscribers per 100 inhabitants



Source: ITU “African Telecommunication Indicators, 2004”, Geneva (May 2004).



- Countries with a more liberal market *generally* saw their positions improve, for instance Ghana, which went up from 40<sup>th</sup> to 27<sup>th</sup>, or Uganda, which rose from 53<sup>rd</sup> to 32<sup>nd</sup>. Other economies that retained monopolies have generally seen their positions deteriorate, such as Comoros, which fell by 17 places, or Ethiopia, which fell by eight places. However, there are also counter examples. Equatorial Guinea has increased its ranking by 18 places despite retaining a monopoly; but here the influence of oil money and increased foreign investment might explain some of the change in status. According to data from UNCTAD (2004: 436), Equatorial Guinea stands second only to Morocco among African economies in terms of foreign direct investment (FDI) totalling some US\$ 1.4 billion in 2003.

Overall, the position is one of increased dynamism, in which all economies have benefited (even the slowest-growing ICT economy in Africa – Liberia – increased its effective teledensity by almost one-third during the last decade) and in which almost half of the economies have sustained an annual growth rate of over 20% during the full decade, meaning that their effective number of users has grown at least six-fold over ten years.

## Conclusion

There is an old saying, that a glass can be described as half-empty or half-full. Both descriptions may be statistically accurate, and fully supported by scientific observation, but the former is backwards-looking and pessimistic while the other is forwards-looking and optimistic. The same is true of the phrases “digital divide” and “digital opportunity”. The former is accurate, and it is possible to show the persistence of incontrovertible differences in level of access to ICTs, both within Africa and between Africa and the rest of the world. But the latter is more likely to attract the investors, and is more in tune with what is currently happening in the region.

To quote from Benjamin Compaine (2001): “My policy recommendation: declare the war against the digital divide won and move on to issues with higher stakes”. Although this was written in a different context, it seems to apply very well to Africa. If we choose to focus only on Africa’s problems, we do a significant disservice to the men and women who have been busy creating a revolution in the field of ICTs in the last few years. Let us rather focus on Africa’s potential, and let us welcome Africa as the newest member of the global information society.

## References

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